

### Remarks

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Claims 1 and 2 have been amended to clarify that the amino acids and peptides are produced from fish egg skins. Support for this amendment can be found throughout the specification, for example in paragraph [0009] on page 4.

The patentability of the present invention over the disclosures of the references relied upon by the Examiner in rejecting the claims will be apparent upon consideration of the following remarks.

Thus, the rejection of claims 1 and 2 under 35 U.S.C. § 103(a) as being unpatentable over JP '368 (English abstract) in view of Haraguchi et al. (abstract), Takasaki et al. (US '197) and Blinkovsky et al. (US '209) is respectfully traversed.

The Examiner states that JP '368 discloses that endo-type proteases and carboxypeptidases decompose the skins of fish eggs such that the fish eggs are used for food. The Examiner further states that the method of JP '368 produces amino acids and peptides because the skin of the fish eggs undergoes proteolysis. The Examiner admits that JP '368 does not teach that the fish eggs having their skin are subjected to ozonolysis, that the endoprotease is derived from *Bacillus*, or the employment of a protease derived from *Aspergillus*.

The Examiner states that Haraguchi et al. teach that fish skin is decontaminated by subjecting the fish to ozonolysis.

The Examiner further states that Takasaki et al. disclose that the proteins of raw unprocessed fish can be decomposed by a protease from *Bacillus subtilisin*.

The Examiner further states that Blinkovsky et al. teach that it is desirable to hydrolyze the proteins of food products with at least an aminopeptidase, such as one produced by *Aspergillus oryzae*.

Applicant's claims are directed to a method for producing amino acids and peptides from fish egg skins, comprising treating ozonized water-treated fish egg skins with a proteolytic enzyme produced by a microorganism of the Bacillus genus [and a proteolytic enzyme produced by a microorganism of the Aspergillus genus (claim 2)] to



degrade contractile proteins which constitute the fish egg skins, to obtain amino acids and peptides.

Applicant asserts that the closest document cited by the Examiner is Takasaki et al. This reference corresponds to JP-B-1-14885, which is discussed as “Patent Document 1” in paragraph [0002] on page 1 of Applicant’s specification. Applicant asserts that the other documents (JP ‘368, Haraguchi et al. and Blinkovsky et al.) merely disclose general fish processing techniques.

Applicant’s claims recite a novel and unobvious method for producing amino acids and peptides from fish egg skins, i.e. the membranes or sacks that contain the fish egg grains. (See Example 1 on page 8 of the specification.) The method has the following essential elements:

Starting material: Fish egg skins (outer membranes that surround fish eggs)

Processing: combination of  
treatment with ozonized water

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treatment with one or more proteolytic enzymes.

None of the cited references, nor the combination thereof, teach or suggest each of the elements of Applicant’s claimed method.

The combination of treatment with ozonized water and treatment with one or more proteolytic enzymes results in the inhibition of denaturation or decomposition of the proteins, which is neither taught nor suggested by any of the cited documents. Applicant has discovered that it is absolutely essential to use the combination of the ozonized water treatment and treatment with one or more proteolytic enzymes for the production of useful products, (e.g., with an advantageous amino acid composition containing high amounts of essential amino acids) from the fish egg skins (fish egg skin wastes). Generally, fish egg skins produced during the processing of fish eggs are discarded as industrial wastes.

Applicant’s claimed method results in unique characteristics and unexpected advantages, as discussed in paragraphs [0018] (including Table 2), [0019], [0023] and [0024] on pages 9, 10 and 12 of Applicant’s Specification, as well as Fig. 1. Specifically, Table 2 compares the results from Example 1 (according to Applicant’s invention),



Reference Example (where a pretreatment with hot water is used in place of the ozone treatment) and a Mackerel extract. The amino acid components obtained from Example 1 are comprised of 17 different amino acids, and the content levels of the essential amino acids are remarkably higher than those from the Reference Example and the Mackerel extract. The high amino acid levels indicate that the denaturation or decomposition of the proteins is inhibited by treatment with ozone and that the proteins are nearly completely degraded by the enzymes. On the contrary, it appears that the low amino acid levels in the Reference Example and the Mackerel extract are due to the denaturation of proteins during the thermal treatment at 70°C or above.

JP '368 merely disclose a technique for removing or thinning the outer skin of fish eggs whereby roe materials are treated to provide fish egg particles utilizable as processed food materials. In this reference, the enzymatically digested fish egg skin products are thrown away, together with enzyme-containing waste liquids resulting from said treatments. Thus, in JP '368, a fish egg with a skin is treated to remove the skin. On the contrary, Applicant's claims require a method of treating fish egg skins.

Takasaki et al. disclose a technique for producing fish and shellfish extracts with various pharmaceutical actions wherein the flesh of fish, eaten as food, is subjected to enzymatic reaction. (In the prior art Working Example, the flesh of mackerel was used.)

However, none of the cited documents teach or suggest the concept for utilization of fish egg skins as useful materials. Applicant's recited method produces amino acids and peptides which can be used in solutions or powders as a food supplement. Thus, Applicant's invention is environmentally advantageous because the fish egg skin, which is normally disposed of as industrial waste, is transformed into something useful. The cited documents fail to teach or suggest how to produce useful amino acid and lower molecular peptide-containing edible products from fish egg skins.

The egg skin of fish is completely different from the flesh of fish when it is utilized as food. As stated previously, the egg skin of fish is generally thrown away as waste.

In the marine industries, including Japan and Korea, many fish egg products are processed. As a result, tons of fish egg skin wastes are produced, which causes problems. Applicant has successfully solved these problems, by creating a method in which the fish



egg skins are treated and thus transformed into a useful product. Applicant's invention is greatly appreciated by Japanese Local Governments, e.g., Fukuoka Prefectural Government, Japan (see Request for Official Financial Support to practice the present invention, directed to the Director of the Fukuoka Prefectural Government, Japan, attached as Appendix 5) and Hokkaido Government, Japan (see Request for Official Financial Support to practice the present invention, directed to the Director of the Hokkaido Government, Japan, attached as Appendix 6). Please also refer to Appendix 7 (copy of weekly paper "Suisan Shinbun", July 7, 2006, Japan, <http://www.suisan.jp/>) and the internet home page, <http://www.kitanichi.jp/njcrir.htm>.

Applicant's invention has the following three main characteristics.

- (1) The starting material is the outer membrane that surrounds fish eggs, generally considered industrial waste.
- (2) The fish egg skins are treated with ozonized water, followed by enzymatic digestion.
- (3) The resultant products have essential amino acids at significantly higher levels (Table 2 & Fig. 1) than the Reference Example product and the mackerel extract, and exert superior ACE-inhibitory activity.

In the cited documents, edible parts of fish and shellfish are treated. On the contrary, in Applicant's invention, the parts that are generally thrown away, the fish egg skins, are treated. In the marine product processing industry, the edible part of fish and shellfish is entirely distinctive from the outer membrane that surrounds fish eggs.

The content levels of essential amino acids in Example 1, according to Applicant's invention, are remarkably higher than those in the Reference Example and the mackerel extract, and the ACE inhibitory activity is nearly equivalent to that of the angiotensin I converting enzyme inhibitory peptide mixture derived from edible sardines. These advantageous features of Applicant's invention are not taught or suggested by the cited documents.

Additionally, Applicant notes that the claims of corresponding Japanese Patent No. 3,691,497 have the identical scope to the claims pending in the current application. (See Appendix 1 and 2, attached hereto.) Furthermore, the corresponding foreign patent applications have already been allowed as CN Patent ZL 03 1 48699.1 (June 19, 2003)



and KR Patent 509,840 (August 16, 2005). (See Appendix 3 and 4, attached hereto.)  
The scope of KR claim 1 is substantially equivalent to that of claim 2 in the current application.

For these reasons, the invention of claims 1 and 2 is clearly patentable over the combination of references relied upon by the Examiner.

Therefore, in view of the foregoing amendments and remarks, it is submitted that the ground of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

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